

U. S. DEPARTMENT OF COMMERCE  
CIVIL AERONAUTICS ADMINISTRATION  
WASHINGTON 25, D. C.

TECHNICAL STANDARD ORDER  
Regulations of the Administrator  
Part 514

SUBJECT: Aircraft Position Lights

TSO-C30b

Part 514—Technical Standard Orders for Aircraft Materials,  
Parts, Processes, and Appliances

Under section 601 of the Civil Aeronautics Act of 1938 and the delegation of authority from the Civil Aeronautics Board in §§ 3.18, 4a.31, 4b.18, 6.18, and 7.18 of the Civil Air Regulations, the Administrator of Civil Aeronautics is authorized to adopt performance standards and specifications of materials, parts, processes, and appliances used in aircraft as he may find necessary to implement provisions of the Civil Air Regulations. The Administrator adopted the Technical Standard Order system as a means to carry out this delegated authority. This system, in brief, provides for CAA-industry cooperation in the development of these performance standards, and a form of self-regulation by industry in demonstrating compliance with these standards. Since the original adoption of this part, which contains the C series TSO's, it has been found desirable to make clarifying editorial and format changes. Hence, Part 514 of the Regulations of the Administrator is being amended to provide two subparts. Subpart A contains the general requirements applicable to all Technical Standard Orders, such as "Method of Conformance," "Marking," and "Deviations." Subpart B contains the technical specifications to which a specific product must conform.

SUBPART A—GENERAL

§ 514.1 *Basis and purpose*—(a) *Basis*. Section 601 of the Civil Aeronautics Act of 1938, as amended, and §§ 3.18, 4a.31, 4b.18, 6.18, 7.18 of the Civil Air Regulations.

(b) *Purpose*. The purpose of this part is to establish minimum performance standards for aircraft materials, parts, processes, and appliances which are to be used on civil aircraft of the United States, and to prescribe the manner by which the manufacturer must show compliance with such performance standards.

§ 514.2 *Method of conformance*. A manufacturer of an aircraft material, part, process, or appliance for which standards are established in Subpart B of this part, prior to distribution for use on a civil aircraft of the United States, shall furnish a written statement of conformance certifying that the material, part, process, or appliance meets the applicable performance standards established in this part. The statement of conformance shall be signed by a person duly authorized by the manufacturer, and shall be furnished to the Chief, Aircraft Engineering Division, Office of Aviation Safety, Civil Aeronautics Administration, Washington 25, D. C.

If complaints of nonconformance with the requirements of this Order are brought to the attention of the CAA and investigation indicates that such complaints are justified,

the Administrator will take appropriate action to restrict the use of the product in civil aircraft.

§ 514.3 *Marking*. Materials, parts, processes, and appliances for which a statement of conformance has been submitted, shall be legibly and permanently marked with the following information:

(a) Name and address of the manufacturer responsible for compliance,

(b) Equipment name, or type or model designation,

(c) Weight to the nearest pound and fraction thereof,

(d) Serial number and/or date of manufacture, and

(e) Applicable Technical Standard Order (TSO) number.

§ 514.4 *Deviations*. No deviation will be granted from the performance standards established in Subpart B. Requests for deviation from other requirements of this part should be addressed to the Aircraft Engineering Division, Office of Aviation Safety, Civil Aeronautics Administration, Washington 25, D. C.

TECHNICAL STANDARD ORDERS ARE OBTAINABLE WITHOUT CHARGE FROM THE CAA, SPECIAL SERVICES DIVISION, INQUIRY UNIT, WASHINGTON 25, D. C.

SUBPART B

§514.41 Aircraft position lights—TSO-C30b—(a) Applicability—

(1) Minimum performance standards. Minimum performance standards are hereby established for position lights which are to be used in civil aircraft of the United States.<sup>1/</sup> New models of position lights manufactured for installation on civil aircraft on or after March 31, 1957, shall meet the standards set forth in SAE Specification AS271, "Aircraft Position Lights," dated October 15, 1952,<sup>2/</sup> with the exception listed in subparagraph (2). Position lights approved by the Civil Aeronautics Administration prior to March 31, 1957, may continue to be manufactured under the provisions of their original approval.

(2) Exception. For the purpose of this order only the standards set forth in subsection 3.3 and section 4 (except subsection 4.3.2.3 and 4.7) need be complied with.

(b) Marking. In lieu of the marking requirement of paragraph (c) of §514.3, the minimum lamp candle power or lamp part number shall be shown.

(c) Effective date. March 31, 1957.

(d) Superseded material. This material supersedes TSO-C29a and TSO-C30a. All position light standards are now contained in this TSO.

- 
- <sup>1/</sup> The number and types of position lights for each aircraft category are established in Civil Air Regulations Parts 3, 4b, 6, and 7. In general, air-carrier aircraft use all five types listed in AS271, section 2, while other aircraft are equipped with types I, II, and III only.
- <sup>2/</sup> Copies may be obtained from the Society of Automotive Engineers, 29 West 39th Street, New York, N. Y.

AIRCRAFT POSITION LIGHTS  
(Commercial Transport Types)

issued 10-15-52  
Revised

1. **PURPOSE:** To specify minimum requirements for aircraft position lights to be used in commercial transport service.
2. **SCOPE:** This specification covers five types of aircraft position lights used in commercial transport service.

Type I - Forward Position Light (red wing-tip light)

Type II - Forward Position Light (green wing-tip light)

Type III - Rear Position Light (white tail light)

Type IV - Rear Position Light (red tail light)

Type V - Fuselage Lights (white, top and bottom)

3. **GENERAL REQUIREMENTS:**

3.1 **Materials and Workmanship:**

3.1.1 **Materials:** Materials shall be of a quality which experience and/or tests have demonstrated to be suitable and dependable for the purpose intended.

3.1.2 **Choice of Materials:** Choice and treatment of materials shall be such as to eliminate or minimize corrosion, fire hazard and fungus growth.

3.1.3 **Workmanship:** Workmanship shall be consistent with high-grade aircraft electrical equipment practice.

3.2 **Identification:**

3.2.1 **Nameplate:** The following information shall be legibly and permanently marked on the unit or attached thereto:

- |  |   |
|--|---|
| a. Name of unit (Position Light, Type )  | d. Manufacturer's part number           |
| b. SAE Specification AS                  | e. Manufacturer's name and/or trademark |
| c. Minimum lamp c.p. or lamp part number |   |

3.3 **Environmental Conditions:** The complete unit shall operate under the following environmental conditions and shall meet the following performance requirements:

3.3.1 **Temperature:** When mounted in accordance with the manufacturer's recommendations, the unit shall function over the range of ambient temperature from -50°C to +55°C. It shall not be adversely affected by exposure to temperatures in the range of -65°C to +70°C.

\* mandatory for CAA approval

- 3.3.2 Humidity: The unit shall function and shall not be adversely affected by exposure to a relative humidity in the range of 5% to 90% throughout a temperature range of -35°C to +55°C.
- 3.3.3 Altitude: The unit shall function and shall not be adversely affected when subjected to a pressure and temperature equivalent to -1000 feet to +40,000 feet standard altitude.
- 3.3.4 Vibration: The unit shall function and shall not be adversely affected when subjected to vibration of 0.060 inch double amplitude at from 600 to 3300 cycles per minute, and with the direction of vibration either parallel or perpendicular to the normal mounting surface.
- 3.3.5 Dust: The unit shall function and shall not be adversely affected when subjected to severe sand and dust conditions.
- 3.3.6 Salt Spray: The unit shall function and shall not be adversely affected when subjected to a salt spray for a period of 100 hours.

#### 4. DETAIL REQUIREMENTS:

- 4.1 Dihedral Angle Coverage, Forward Position Lights Types I and II and Rear Position Lights Type III and IV: When mounted on aircraft in accordance with the manufacturer's instructions, the forward and rear position lights shall show unbroken light within the dihedral angles specified in Fig. 1, and defined in 4.1.1.

Position Light Type	Dihedral Angle
Type I (forward, red)	L (left)
Type II (forward, green)	R (right)
Type III (rear, white)	A (aft)
Type IV (rear, red)	A (aft)

Fig. 1 Dihedral Angle Coverage, Forward & Rear Position Lights

##### 4.1.1 Definitions of Dihedral Angles:

1. Dihedral Angle L (left): The dihedral angle formed by two intersecting vertical planes, one parallel to the longitudinal axis of the airplane, and the other at 110° to the left of the first, when looking forward along the longitudinal axis.
2. Dihedral Angle R (right): The dihedral angle formed by two intersecting vertical planes, one parallel to the longitudinal axis of the airplane, and the other at 110° to the right of the first, when looking forward along the longitudinal axis.

- 3 -

3. Dihedral Angle A (aft): The dihedral angle formed by two intersecting vertical planes making angles of  $70^{\circ}$  to the right and  $70^{\circ}$  to the left, respectively, looking aft along the longitudinal axis, to a vertical plane passing through the longitudinal axis.

4.2 Hemispheric Coverage, Fuselage Lights, Type V: When mounted on aircraft in accordance with the manufacturer's instructions, the top and bottom fuselage lights shall show unbroken light in the regions specified as follows:

1. Top Fuselage Light, Type V, White: The hemisphere above the horizontal plane.
2. Bottom Fuselage Light, Type V, White: The hemisphere below the horizontal plane.

4.3 Position Light Intensity Distribution:

4.3.1 General: The intensities specified in this section shall be provided by new equipment with all light covers and color filters in place, when mounted on aircraft in accordance with the manufacturer's instructions. Intensities shall be determined with the light source operating at the normal operating voltage of the airplane.

4.3.2 Minimum Intensity Distribution, Forward Position Lights Types I and II, and Rear Position Lights Types III and IV:

4.3.2.1 Minimum Intensities in the Horizontal Plane: The intensities in the horizontal plane shall not be less than the values given in Fig. 2. The horizontal plane is defined as the plane containing the longitudinal axis of the airplane and is perpendicular to the plane of symmetry of the airplane.

Position Light Considered	Angle from Right or Left of Longitudinal Axis, Measured from Dead Ahead	Minimum Intensity
Type I (fwd., red)	$0^{\circ}$ to $10^{\circ}$	40 Candles
Type II (fwd., green)	$10^{\circ}$ to $20^{\circ}$	30 Candles
	$20^{\circ}$ to $110^{\circ}$	5 Candles
Type III (rear, white)	$110^{\circ}$ to $180^{\circ}$	20 Candles
Type IV (rear, red)	$110^{\circ}$ to $180^{\circ}$	4 Candles

Fig. 2 Minimum Intensities in the Horizontal Plane, Forward and Rear Position Lights.

- 4 -

- 4.3.2.2 Minimum Intensities above and below the Horizontal Plane: The intensities in any vertical plane shall not be less than the appropriate value given in Fig. 3, when  $I$  is the minimum intensity specified in Fig. 2 for the corresponding angles in the horizontal plane. Vertical planes are defined as planes perpendicular to the horizontal plane.

Angles Above or Below Horizontal, In any Vertical Plane	Minimum Intensity
0°	1.00 $I$
0° to 5°	0.90 $I$
5° to 10°	0.80 $I$
10° to 15°	0.70 $I$
15° to 20°	0.50 $I$
20° to 30°	0.30 $I$
30° to 40°	0.10 $I$
40° to 90°	At least 2 candles

Fig. 3 Minimum Intensities in any Vertical Plane, Forward and Rear Position Lights.

- 4.3.2.3 Maximum Intensities in Overlap Regions, Forward Position Lights Type I and II, and Rear Position Lights: The intensities in overlaps between any forward or rear position light shall not exceed the values given in Fig. 4. Area A represents the overlap in any plane bounded by two straight lines forming angles of  $10^\circ \cos \theta$  and  $20^\circ \cos \theta$  to the common boundary of the dihedral angles considered.  $\theta$  is the angle of the plane to the horizontal plane. Area B represents the overlap in any plane beyond  $20^\circ \cos \theta$ .

Overlaps	Maximum Intensity	
	Area A	Area B
Type I (fwd., red) in dihedral angle R	10 Candles	1 Candle
Type I (fwd., red) in dihedral angle A	5 Candles	1 Candle
Type II (fwd., green) in dihedral angle L	10 Candles	1 Candle
Type II (fwd., green) in dihedral angle A	5 Candles	1 Candle
Type III (rear, white) in dihedral angle L	5 Candles	1 Candle
Type III (rear, white) in dihedral angle R	5 Candles	1 Candle
Type IV (rear, red) in dihedral angle L	5 Candles	1 Candle
Type IV (rear, red) in dihedral angle R	5 Candles	1 Candle

Fig. 4 Maximum Intensities in Overlaps Between Forward and Rear Position Lights.

- 5 -

4.3.3 Intensity Distribution, Fuselage Lights, Type V: The intensity distribution of the top and bottom fuselage light shall be approximately uniform over their respective hemispheres of coverage as specified in 4.2. The illumination provided shall be equivalent to that furnished by a 32 candlepower lamp installed in a reflector of high reflective properties. The lights shall have a clear cover.

4.4 Position Light Colors: The colors of the position lights shall be in accordance with Fig. 5, and shall conform to 4.4.1.

Position Light	Color
Type I (left forward)	Aviation red
Type II (right forward)	Aviation green
Type III (rear)	Aviation white
Type IV (rear)	Aviation red
Type V (top and bottom)	Aviation white

Fig. 5 Position Light Colors.

4.4.1 Position Light Color Specifications: The colors of the position lights shall have the International Commission on Illumination chromaticity coordinates as follows:

1. Aviation Red  
 $y$  is not greater than 0.335  
 $z$  is not greater than 0.002
2. Aviation Green  
 $x$  is not greater than  $0.440 - 0.320 y$   
 $x$  is not greater than  $y - 0.170$   
 $y$  is not less than  $0.390 - 0.170 x$
3. Aviation White  
 $x$  is not less than 0.350  
 $x$  is not greater than 0.540  
 $y - y_0$  is not numerically greater than 0.01,  $y_0$  being the  $y$  coordinate of the Planckian radiator for which  $x_0 = x$ .

4.5 Light Covers and Color Filters: For all position lights, the light covers or color filters used shall be non-combustible material and shall be constructed so that they will not change color or shape or suffer any appreciable loss of light transmission during normal use.

4.6 Dielectric: The unit shall not be adversely affected by the application of 500 volts r.m.s. at 60 cycles between any current carrying parts and ground.

4.7 Life: The position lights shall operate 1000 hours with no adjustment or replacement of parts other than the replacement of the lamp.